

---

**(12) PATENT ABRIDGMENT      (11) Document No. AU-B-47719/90**  
**(19) AUSTRALIAN PATENT OFFICE      (10) Acceptance No. 630400**

---

- (54) Title  
WHEEL DRIVE UNIT SEALING MECHANISM
- International Patent Classification(s)  
(51)<sup>4</sup> F16J 015/16      F16D 003/84      F16J 015/54
- (21) Application No. : 47719/90      (22) Application Date : 05.01.90
- (43) Publication Date : 03.05.90
- (44) Publication Date of Accepted Application : 29.10.92
- (62) Related to Division(s) : 57176/86
- (71) Applicant(s)  
JOY MANUFACTURING CO PTY LTD
- (72) Inventor(s)  
EDWARD WECHNER
- (74) Attorney or Agent  
GRIFFITH HACK & CO. , GPO Box 4164, SYDNEY NSW 2001
- (56) Prior Art Documents  
AU 524698 56066/80 F16J 15/32,15/24 F16D3/84
- (57) Claim

1. A sealing mechanism for a vehicle wheel drive unit having a drive box, a driven half shaft extending from the drive box to a hub unit arranged to pivot on a king pin for steering of the vehicle, and a universal joint at the hub unit end of the half shaft arranged to transmit drive from the half shaft to a wheel supported by the hub unit. the sealing mechanism comprising a tube placed coaxially over the half shaft and extending from a position within the drive box through an opening therein provided with a seal to a point adjacent the universal joint where the tube terminates in a hemispherically shaped cup positioned adjacent and/or over the drive shaft end of the universal joint, a cover plate fastened to the drive shaft end of the hub unit so as to seal the interior thereof and incorporating a circular opening therein coaxial with the half shaft and having a narrow edged flange arranged to bear against the outer surface of the cup, and biasing means arranged to bias the tube axially on the half shaft, forcing the outer face of the hemispherically shaped cup into contact with the narrow edged flange on the cover plate.

FORM 1  
COMMONWEALTH OF AUSTRALIA  
PATENTS ACT 1952  
APPLICATION FOR A STANDARD PATENT (OR DIVISIONAL)  
OR A STANDARD PATENT OF ADDITION

630400

We, JOY MANUFACTURING CO PTY LTD  
of, Vale Road, Moss Vale, New South Wales, 2577, Australia

hereby apply for the grant of a standard patent for an invention entitled:

"WHEEL DRIVE UNIT SEALING MECHANISM"

which is described in the accompanying complete specification.

Number of original application 57176/86

Person by whom made Joy Manufacturing Company Pty Limited

Our address for service is:

GRIFFITH HACK & CO.  
71 YORK STREET  
SYDNEY NSW 2000  
AUSTRALIA

DATED this 4th day of January, 1990

JOY MANUFACTURING CO PTY LTD  
By their Patent Attorneys

  
GRIFFITH HACK & CO.

TO: THE COMMISSIONER OF PATENTS  
COMMONWEALTH OF AUSTRALIA

AUSTRALIA  
Patents Act 1990

**NOTICE OF ENTITLEMENT**

We Joy Manufacturing Co Pty Ltd  
of Vale Road, Moss Vale, New South Wales 2577, Australia

being the Applicant and Nominated Person, in respect of Application No. 47719/90,  
entitled Wheel Drive Unit Sealing Mechanism state the following:

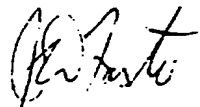
This application is a divisional application of Australian Patent Application No.  
57176/86, filed in the name of Joy Manufacturing Co Pty Ltd.

Edward Wechner is the actual inventor of the invention.

The inventor made the invention for and on behalf of the nominated person in the  
course of his duties as an employee of the nominated person.

DATED this 28th day of August 1992

Joy Manufacturing Co Pty Ltd  
By their Patent Attorney



GRIFFITH HACK & CO

COMMONWEALTH OF AUSTRALIA

PATENTS ACT 1952

Form 10

COMPLETE SPECIFICATION

(ORIGINAL)

FOR OFFICE USE

Short Title:

Int. Cl:

Application Number:  
Lodged:

Complete Specification-Lodged:  
Accepted:  
Lapsed:  
Published:

Priority:

Related Art:

---

TO BE COMPLETED BY APPLICANT

Name of Applicant: JOY MANUFACTURING CO PTY LTD  
Address of Applicant: Vale Road, Moss Vale, New South Wales,  
2577, Australia  
Actual Inventor: EDWARD WECHNER  
Address for Service: GRIFFITH HACK & CO.  
71 YORK STREET  
SYDNEY NSW 2000  
AUSTRALIA

Complete Specification for the invention entitled:  
"WHEEL DRIVE UNIT SEALING MECHANISM"

The following statement is a full description of this invention, including  
the best method of performing it known to me/us:-

This invention relates to a wheel drive unit sealing mechanism and has been devised particularly though not solely for use in steered and driven wheel drive units in heavy machinery such as earth moving machinery or mining machinery.

Much heavy machinery such as earth moving machinery or mining machinery incorporates wheels which are both driven and steered. The wheel drive units for such vehicles are generally complex in nature in order to provide both the drive to the wheel and yet allow for the wheel to be turned for the steering of the vehicle. As such vehicles frequently operate in adverse conditions where there may be mud or abrasive grit, it is a problem to provide a sealing mechanism for the wheel drive units which will permit the turning movement of the wheel for steering while at the same time protecting the bearings and the universal joints contained within such units from wear due to the ingress of mud or grit.

Sealing mechanisms provided in the past are reasonably effective when new and clean, but after a period of use mud or grit tends to build up between the moving parts of the sealing mechanism, forcing those moving parts apart and allowing the mud or grit to seep into the internal workings of the wheel drive unit.

It is therefore an object of the present invention to provide a sealing mechanism for a wheel drive unit which will obviate or minimise the foregoing disadvantages in a simple yet effective manner or which will at least provide the public with a useful choice.

Accordingly the invention consists in a sealing mechanism for a vehicle wheel drive unit having a drive box, a driven half shaft extending from the drive box to a hub unit arranged to pivot on a king pin for steering of the vehicle, and a universal joint at the hub unit end of the half shaft arranged to transmit drive from the half shaft to a wheel supported by the hub unit.

the sealing mechanism comprising a tube placed

The drive unit further comprises a hub unit (6) comprising a casing (7) from which extend vertical king pins (8) rotatably mounted in bearings (9) carried by carrier arms (10) extending outwardly from the drive box (1). In this manner the hub unit may be pivoted on the king pins (8) by way of a steering mechanism (not shown) to turn the wheel of the vehicle for steering.

A wheel hub (11) is mounted in the hub unit by way of bearings (12) and a wheel mounted on the hub in the conventional manner. The hub unit may also be provided with a planetary gear train as shown in the accompanying drawings driven by a shaft (13).

The shaft (13) is driven in turn through a universal joint which is preferably a constant velocity joint (14) vertically aligned with the king pins (8) and driven in turn by a half shaft (15) driven by the worm wheel (4) in the drive box (1).

In the prior art wheel drive unit shown in Fig. 1 the interior of the hub unit is sealed from the ingress of mud or grit by way of a cover plate (16) fastened to the interior face of the hub member (7). the cover plate incorporating an interior hemispherical surface (18) provided with an opening (17) coaxial with the half shaft (15). The sealing mechanism further comprises a tube (19) coaxial with the half shaft (15) and mounted to the drive unit by being engaged within an aperture (20) within a casting (21). The interior of the drive box is sealed by a seal (22) between the casting (21) and a shoulder on the worm wheel (4).

The hub unit end of the tube (19) is provided with a hemispherically shaped cup (23) arranged to mate with the hemispherical surface (18) on the interior of the cover plate (16) so that rotational movement of the cover plate over the hemispherical cup (23) about the king pins (8) will accommodate the steering movement of the hub member relative to the drive box. To this end (although not apparent from Fig. 1) the opening (17) in the cover plate is elongate in a

direction perpendicular to the plane of the drawing of Fig. 1. An O-ring seal (24) is provided mounted in the cover plate (16) and arranged to bear against the outer hemispherical surface of the cup (23).

5 The sealing mechanism shown in Fig. 1 has the disadvantage that mud or grit can work in through the opening (17) in the cover plate, particularly due to the elongate shape of that opening and build up between the concave hemispherical surface (18) in the cover plate and  
10 the convex hemispherical surface of the cup (23). This build up of mud or grit forces the two surfaces apart allowing the mud or grit to ooze into the interior of the hub member and eventually destroy the constant velocity joint (14) or the bearings within the hub member. The cup  
15 (23) is engaged with the concave hemispherical surface (18) by way of diaphragm springs (25) engaged between the casting (21) and a circumferential groove in the tube (19). Due to the nature of the spring and the large bearing surface between the cover plate (16) and the cup (23) it is impossible to maintain sufficient pressure to prevent the  
20 ingress of mud or grit.

Turning now to Fig. 3 which is similar to Fig. 1 in the configuration of the drive box and the hub unit (and where like numbers are used to indicate like components) the  
25 sealing mechanism according to the invention will now be described.

The sealing mechanism comprises a tube (30) coaxial with the half shaft (15) and extending from one end (31) within the drive box (1), through an opening (32) in the  
30 drive box provided with a seal (33) to a point adjacent the constant velocity joint (14) where the tube terminates in a hemispherically shaped cup (34) positioned adjacent and/or over the drive shaft end of the constant velocity joint.

The cover plate (16) is provided with a circular  
35 opening therein coaxial with the half shaft (15) and having a narrow edged flange (35) arranged to bear against the outer surface of the hemispherical cup (34). The cover

plate is also provided with a seal (36) adjacent the narrow edged flange (34) on the interior side of the hub unit, arranged to bear against the hemispherical cup (34).

5 The outer surface of the hemispherical cup is forced against the narrow edged flange (35) by way of a helical compression spring (37) coaxially mounted over the tube (30) and engaged between a shoulder (38) at the end of the tube (30) and the inner face of a casting (39) forming part of the drive box (1). Under the action of the compression  
10 spring (37) the tube (30) is biased from ~~left to right~~<sup>right to left</sup> as seen in Fig. 3 forcing the convex hemispherical surface of the cup (34) against the narrow edged flange (35) in the cover plate (16). In this configuration it is possible to provide a spring of considerable force to give a high  
15 contact pressure between the narrow edged flange (35) and the cup (34).

20 In use, that pressure combined with the narrow nature of the flange (35) forms an effective wiping surface between the flange and the cup (34) which is effective to cut through and wipe away any mud or grit on the exterior  
25 surface of the cup (34) during steering movement of the hub member relative to the drive box. This wiping action keeps any mud or grit from the seal (36) and effectively prevents the ingress of mud or grit into the interior of the hub unit (7), protecting the constant velocity joint and the bearings therein.





THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS

1. A sealing mechanism for a vehicle wheel drive unit having a drive box, a driven half shaft extending from the drive box to a hub unit arranged to pivot on a king pin for steering of the vehicle, and a universal joint at the hub unit end of the half shaft arranged to transmit drive from the half shaft to a wheel supported by the hub unit, the sealing mechanism comprising a tube placed coaxially over the half shaft and extending from a position within the drive box through an opening therein provided with a seal to a point adjacent the universal joint where the tube terminates in a hemispherically shaped cup positioned adjacent and/or over the drive shaft end of the universal joint, a cover plate fastened to the drive shaft end of the hub unit so as to seal the interior thereof and incorporating a circular opening therein coaxial with the half shaft and having a narrow edged flange arranged to bear against the outer surface of the cup, and biasing means arranged to bias the tube axially on the half shaft, forcing the outer face of the hemispherically shaped cup into contact with the narrow edged flange on the cover plate.

2. A sealing mechanism as claimed in claim 1 wherein the biasing means comprise a helical compression spring coaxially mounted over the tube and compressed between a shoulder at the drive box end of the tube and the inner face of the drive box.

3. A sealing mechanism as claimed in either claim 1 or claim 2 wherein a circular seal is provided in the cover plate adjacent the narrow edged flange toward the interior of the hub unit, arranged to bear against the outer surface of the cup.

4. A sealing mechanism for a vehicle wheel drive unit substantially as described herein with reference to figure 3 of the accompanying drawings.

DATED this 28th day of APRIL 1986

JOY MANUFACTURING COMPANY PTY. LIMITED

By their Patent Attorneys

GRIFFITH HASSEL & PRAZER

33768

33768

33768

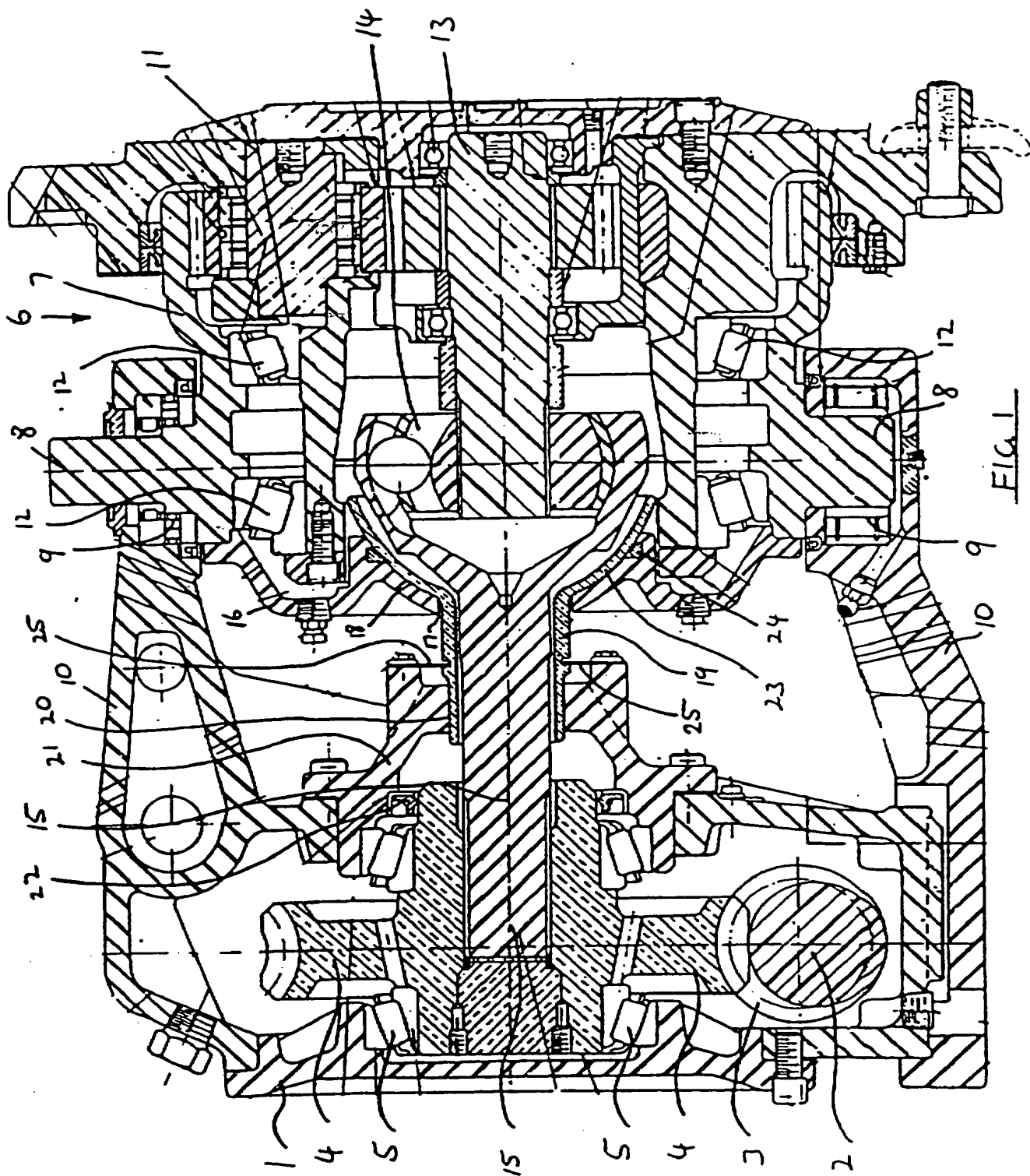


FIG. 1

